

Mobilising adaptive capacity to multiple stressors: Insights from small-scale coastal fisheries in the Western Region of Ghana



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ABSTRACT

The processes by which adaptive capacity is mobilised in response to multiple stressors are yet to be fully understood. This study addresses this pressing research gap by drawing on the capitals framework and empirical data from small-scale coastal fisheries in the Western Region of Ghana. It employs an ethnographic approach, based on multiple sources of evidence including documents, interviews and participant observation to examine mechanisms of mobilising adaptive capacity in response to climate and non-climate stressors. Our findings suggest that responding to stressors involves mobilising sets of main-available capitals, such as local innovation, ability to improvise, new technologies, corrupt practices and belief systems (cultural capital); collective action, networks and social ties (social capital); and complaints to the government (political capital). These capitals were the main constituents of adaptive capacity, particularly considering non-responsive government and formal organisations. Further, other forms of capitals, i.e., local leadership, local knowledge, learning capacity, and training (human capital); networks, collective actions, associations and bonding ties (social capital); sand (natural capital); funds from fishing (financial capital), combine in complex ways to mobilise such available capitals. This understanding is critical if synergies among main-available and supporting-available capitals are to support building and mobilizing adaptive capacity. Further, it may help guide important decisions, proactive plans and strategic investment for developing key capitals to enhance adaptive capacity.

1. Introduction

Small-scale coastal fisheries (SSCF) are sensitive and constantly exposed to multiple climate (e.g., flooding, coastal erosion, severe storms, ocean acidification and increased sea surface temperature) and non-climate stressors (e.g., poverty, poor governance, lack of alternative employment and diseases), with serious implications for livelihoods and coastal environments. In this study, stressors are conceptualised as any new or old internal or external driver of change that may directly or indirectly impede the development of small-scale fisheries (McDowell and Hess, 2012; Bunce et al., 2010; O'Brien et al., 2009).

Expected effects of climate change include species loss in tropical reef fisheries, decrease community turnover in tropical fisheries, and increase fish diversity and yield in Arctic waters (MacNeil et al., 2010). Moreover, Sumaila et al. (2011) noted that non-climate stressors, such as overfishing, habitat degradation, pollution, and inappropriate fishing methods challenge fishers' ability to adapt to climate change. In sum, climate-related stressors very often intensify the impacts of non-climate

stressors, leading to a decline in fishery resources and, consequently, livelihoods (Sumaila et al., 2011; MacNeil et al., 2010). Similarly, non-climate stressors can increase the vulnerability to climate stressors. While there is a broad understanding that fishers' and coastal communities' success in responding or adapting to these stressors will depend on their adaptive capacity (Cinner et al., 2015; Bennett et al., 2014; Dolan and Walker, 2006), the processes of mobilising and using such capacity are yet to be fully understood.

Research on adaptive capacity, adaptation and vulnerability has grown over the past few decades (Jonah, 2015; Wagner et al., 2014; Eisenack and Stecker, 2012; Engle, 2011). There has also been increasing attention to the impacts of climate change on SSCF and coastal communities (e.g., Cinner et al., 2012; Dolan and Walker, 2006; Baptiste and Kinlocke, 2016). Such research generally examines how different forms of resources or pre-conditions may influence adaptive capacity. However, research examining how resources are mobilised to enhance adaptive capacity are still emerging (Keys et al., 2014; Leonard et al., 2013; Dumar, 2010). For example, Dumar (2010) showed that adaptive capacity is enhanced through increasing awareness of the

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community about climate change risks, forging of networks that enhance access to information and resources. Similarly, Allen (2006) revealed that local adaptive capacity to climate change and environmental stresses is built through technical information dissemination and training, increasing awareness of risk and vulnerability, and accessing local knowledge and resources. Keys et al. (2014) showed that adaptive capacity can be enhanced through three key strategies: increasing scientific knowledge on climate change by supporting the introduction of related programs in schools; developing informed social networks by facilitating, fostering, and sustaining citizen forums; and, engaging local people in identifying specific sources of vulnerability. Notwithstanding, studies focusing on how interactions among various forms of resources influence adaptive capacity are seemingly scarce.

This study adds to the emerging literature outlined above by further exploring processes of mobilising adaptive capacity. Specifically, it analyses how the various types of capitals are mobilised and used in response to climate and non-climate stressors. It draws on an empirical ethnographic study of three small-scale fishing communities of the Western Region of Ghana and is guided by the vulnerability and capitals frameworks. By doing so, this research provides a better understanding of the synergies among important forms of capital for enhancing adaptive capacity with significant implications for adaptation policy and practice.

1.1. Situating stressors in the context of the vulnerability framework

Generally, vulnerability is conceptualised as the susceptibility to adverse effects of climate change (Adger, 2006; Smit and Wandel, 2006). The concept of vulnerability emerged from the social and natural sciences; more specifically, the field of natural hazards (Nelson, 2011; Gallopín, 2006; Cutter et al., 2003). However, it has since advanced in many fields, including food security (Sen, 1981), sustainable livelihoods (Chambers and Conway, 1992) and global environmental change (Brooks, 2003; Kelly and Adger, 2000). The vulnerability of a system (e.g., small-scale coastal fisheries) is expressed by the system's exposure and sensitivity to disturbances, and its adaptive capacity to respond to such disturbances (Nelson et al., 2007; Adger, 2006; Gallopín, 2006; Turner et al., 2003). In the context of this study, exposure and sensitivity capture the disposition of existing and new disturbances faced by SSCF, and how they experience such disturbances. This is called stressors here; but, is also known as stresses or drivers (Adger, 2006; Gallopín, 2006; Smit and Wandel, 2006; Kasperson, 2005). A system is considered vulnerable when it is exposed and sensitive to stressors and has limited adaptive capacity. Exposure is the extent to which a system is in contact with or confronted with stressors, including the size, rate, and length of stressors (Adger, 2006; Kasperson, 2005; Smit and Wandel, 2006). Sensitivity is the extent to which a system reacts to, or is affected by the impacts of stressors (Adger, 2006; Luers, 2005). Adaptive capacity is the system's ability to adjust to, or cope with real or anticipated impacts of stressors, while keeping or improving its conditions (Engle, 2011; Gallopín, 2006; Nelson et al., 2007).

Studies on stressors (both climate and non-climate) have increasingly gained attention in climate change vulnerability studies. Part of these studies focus on multiple or 'double exposure' to climatic and non-climatic stressors to understand the vulnerability (Perry et al., 2011; Zou and Wei, 2010; O'Brien et al., 2009; O'Brien and Leichenko, 2000). In the context of the fisheries literature, it is argued that SSCF, as mentioned above, are often vulnerable to climate change because of inherent non-climatic stressors within the sector, such as diseases, overfishing, pollution, low income, poverty and poor governance (e.g., Sumaila et al., 2011; Andrew et al., 2007; Dugan, 2005; Ellis and Freeman, 2005).

While a system's exposure and sensitivity to stressors may be inevitable, its adaptive capacity can be mobilised or enhanced to reduce its vulnerability. Adaptive capacity is the system's ability to adjust to, or

cope with, actual or perceived effects of climate change without compromising its conditions (Engle, 2011; Nelson et al., 2007; Gallopín, 2006). Adaptive capacity can reduce vulnerability with implications for adaptation and socio-economic development (Adger, 2006; Gallopín, 2006; Brooks, 2003). It is, therefore, a critical factor of adaptation. If adaptive capacity includes assessment of the potential of a system to cope with or adapt to the threats of climate change, then enhancing the adaptive capacity of such system is integral to undertaking adaptation.

1.2. Using the capitals framework to assess adaptive capacity

Capitals and resources are critical elements in the various definitions of adaptive capacity. For example, Nelson (2011) and Nelson et al. (2007) define adaptive capacity as sets of resources and the ability to organise and use these resources to respond or adapt to climatic stressors. However, the ability to adapt does not imply the mere existence of such resources, but the skills to wisely use them (Nelson, 2011). Other examples of how capitals feature in the explanation of adaptive capacity include the conceptualisation of adaptive capacity as sets of societal indicators, such as technology, infrastructure and knowledge that are controlled and managed by public and economic policies and policy-makers (Engle, 2011; Gupta et al., 2010; Dolan and Walker, 2006). Gupta et al. (2010: 461) define adaptive capacity as features of institutions that enable social actors to cope with or adapt to short and long-term impacts of climate change. Moreover, Dolan and Walker (2006) argue that adaptive capacity of a community or a system is found in the quantity and quality of its infrastructure and managerial skills for reducing negative impacts of climate change. Drawing on these concepts and definitions, adaptive capacity in this study refers to the different and interacting forms of capitals mobilised and used in response to climate and non-climate stressors. Such forms of capitals are those comprising the capitals framework, i.e., natural, cultural, human, social, political, and built capitals (Emery and Flora, 2006; Flora et al., 2004; Chambers and Conway, 1992). We conceptualise the meaning and relevance of the different forms of capitals to the assessment of adaptive capacity in Table 1.

The capitals framework is consistent with the assessment of adaptive capacity (Engle, 2011; Adger, 2010; Pelling and High, 2005). For instance, determinants of adaptive capacity such as risk perception (Ekstrom et al., 2011; Dolan and Walker, 2006) and policy beliefs (Fidelman et al., 2014) can be categorised as cultural capital. Formal institutions and informal norms (Pahl-Wostl, 2009) are examples of political capital. Social actors and their knowledge and skills (Eisenack and Stecker, 2012) are forms of human capital. Important features of such capitals are that they can be obtained, developed and transferred across generations (Moser, 2007), suggesting that adaptive capacity can be mobilised, enhanced and conveyed from one sector, community or place or time to another. Nevertheless, the use of the capitals framework in assessments of adaptive capacity is still scarce – as opposed to its wide use in community development and livelihood studies (Emery and Flora, 2006; Pelling and High, 2005; Bebbington, 1999). In this study, two categories of capitals are conceptualised, i.e., available and desired capitals. Available capitals include capitals at hand and in suitable condition to be used for enhancing adaptive capacity. In contrast, desired capitals are not readily available but are deemed necessary for further building adaptive capacity.

2. Description of communities studied and methods

The study includes three coastal fishing communities in the Western region of Ghana: Dixcove in the Ahanta West District Assembly, Abuesi in the Shama District Assembly, and New Tarkoradi in the Sekondi-Tarkoradi Metropolitan Assembly (Fig. 1). They were selected based on the concentration of fishing activities, high dependence on fisheries for livelihood, presence of various forms of capitals and multiple climate and non-climate stressors, i.e., overfishing, coastal erosion, oil

Table 1

Meaning and relevance of different forms of capitals and corresponding indicators to the assessment of adaptive capacity.

Capitals	Meaning	Implications for adaptive capacity	Indicators of adaptive capacity
Natural Capital	Natural capital refers to assets that are found in nature. This may vary from one geographical location to another. It may include weather, location, ocean, fish, wildlife, precious minerals and vegetation (Dhakal, 2011; Scoones, 1998; Voora and Venema, 2008)	Natural capital forms the basis for food, livelihood, wellbeing and employment (Dhakal, 2011; Voora and Venema, 2008; Scoones, 1998). Plans and actions for preserving, conserving restoring, or developing the quality and quantity of this capital influence adaptive capacity	Healthy and abundant natural resources, which provide ecosystem goods and services
Cultural capital	Cultural capital portrays how people perceive their world and how they operate within it, including their traditions and language (Bennett and Silva, 2011)	Cultural capital underlies how people perceive climate change and other stressors and their effects on them (Bennett and Silva, 2011). It also determines whose views are respected and who is influential in a community and; and how creativity, innovation and influence start, build up, and spread (Flora et al., 2004; Bebbington, 1999; Bourdieu, 1986). It partly determines the rules on how actors interact (Flora et al., 2004; Bebbington, 1999; Bourdieu, 1986). Consideration of this type of capital and efforts taken to improve it translate into adaptive capacity	Cultural awareness is reflected in new ways of thinking, strategizing, innovation, and creativity in adapting to stressors
Human capital	Human capital refers to the skills and abilities of people, including leadership, to develop and multiply benefits from their resources. It is used to gain access to potential resources needed to advance community development (Becker, 2009; Flora et al., 2004)	Human capital captures requisite expertise, and quantity and quality of people (actors) and/or leadership needed to assess stressors, and mobilise capitals in response to these stressors (Becker, 2009; Flora et al., 2004). The mobilisation of human capital is also influenced by cultural and social capitals (Flora et al., 2004). Efforts to increase local expertise and skills of local people to understand stressors and how to deal with them enhance adaptive capacity (Flora et al., 2004)	Acquisition and use of both local and scientific knowledge about climate change and social-ecological systems Use of skills and abilities of both local and external people for adaptation Taking initiatives and responsibility for community development among actors and being innovative
Social Capital	Social capital refers to connections and relationships among people and organisations (Narayan-Parker, 1999)	Efforts and actions to link local organisations with each other and with external ones, increasing the quality and quantity of associations, networks and improving both internal and external communications can enhance adaptive capacity (Narayan-Parker, 1999)	Good health care, education and work force The quality of networks, communication, cooperation and trust among local institutions and with external institutions for adaptation Involvement of new groups and partners for adaptations. Increased community cooperation for adaptation Participation of local and external actors in adaptation efforts
Political capital	Political capital refers to people's ability to access power, authority, important institutions and make decisions that enhance development of their communities (Flora et al., 2004)	Actions and conditions created to improve and secure community's or people's access to relevant resources, and assist them in participating in decisions to address impacts of stressors build adaptive capacity (Flora et al., 2004)	Ability to secure resources for adaptations through government and non-governmental officials. Good relationship and communication between community and government. Inclusive and better governance
Financial capital	Financial capital is money that can be used to invest in community capacity-building for purposes of wealth creation and accumulation, establishing and sustaining livelihoods, and social or business innovations (Lorenz, 1999)	Using and investing existing funds judiciously; seeking and securing new sources of funds to enhance adaptive capacity (Lorenz, 1999)	New funding sources to address important stressors and support adaptation Proper management of existing funds
Built capital	Built capital is the infrastructure for supporting other forms of capital and development activities (Flora et al., 2004)	Built capital constitutes physical infrastructure that supports livelihoods and other capitals to link local people together equitably, connect local people, institutions, and businesses to the outside (Flora et al., 2004)	Relevant infrastructure (landing beaches, storage facilities, roads, etc.) built or improved to support livelihoods

exploitation, and climate change (Table 2). Fantes are the dominant ethnic group in all the communities. While the district assembly is the formal institution responsible for decision-making and enforcement, and provisions of important services in the communities, the chief fisherman and the community chief constitute the informal institutions responsible for decision-making processes and enforcement of community and fisheries related regulations.

Dixcove is in the Ahanta West District Assembly, sharing boundaries to the east with Busua, west with Achowa and Sunkoe to the north. Two streams drain the area: 'Nana Pia' and 'Mfuma Etsifi'. Abuesi is part of the Shama district; it has two landing sites along its coast (Abuesi and Kesewokan). Houses in Abuesi are generally built with mud coated with cement with corrugated roofing sheets. New Takoradi is in the Sekondi-Takoradi Metropolitan Assembly. It has a 31.5 acre of forest reserve (Monkey Hill), located at northern part of the town. SSCF in these communities are particularly exposed to multiple climate and non-climate stressors (Table 3).

The climate stressors are likely to increase in the future based on

climate projections. Sea levels in Ghana are likely to rise every decade by an average of 0.3 cm from 3.6 cm by 2010 to 34.5 cm by 2080 (MoEST, 2011), with severe implications for SSCF and coastal communities. Moreover, Ghana's annual mean temperature is predicted to increase between 1.0 °C and 3.0 °C by 2060s and between 1.5 °C and 5.2 °C by 2090s (McSweeney et al., 2010).

This study used an ethnographic method and multiple sources of evidence, i.e., semi-structured interviews, participant observation and document analysis. Data collection and analysis were framed by the Vulnerability and Capitals frameworks as conceptualised above (Sections 1.1 and 1.2), and focused specifically on the processes of mobilising and using adaptive capacity (defined in terms of capitals) for current and preferred responses to the stressors listed in Table 3.

Semi-structured interviews (n = 43) and participant observation were conducted between October 2014 and March 2015 in the selected fishing communities (Dixcove, Abuesi and New Takoradi). Respondents comprised of 30 fishers (10 from each study community), 6 traditional leaders (3 chief fishermen, 3 community chiefs from each community),

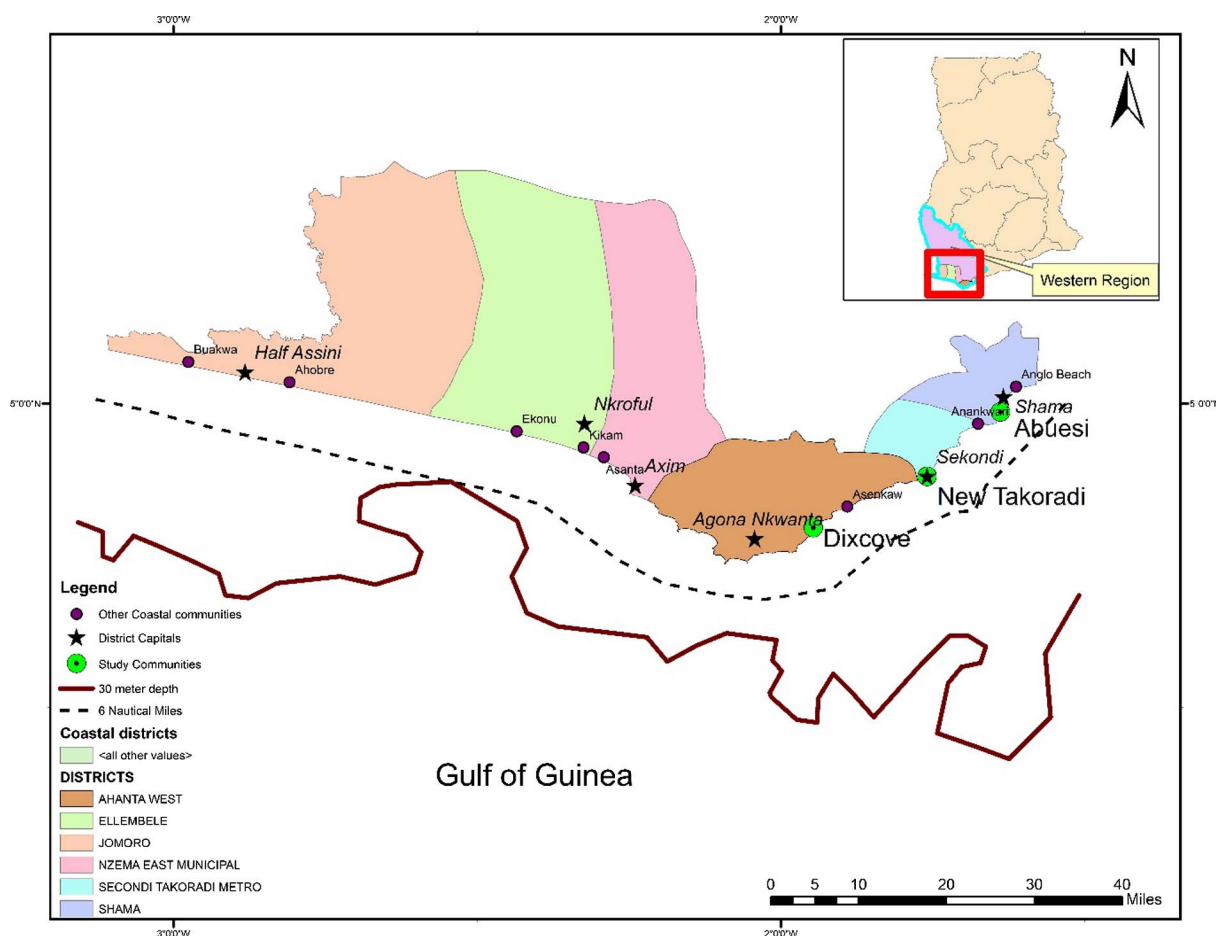


Fig. 1. Location of the fishing communities studied in the Western Region of Ghana.

Table 2

Characterisation of the communities studied.

Source: CRC and FoN (2010); Stevens et al. (2013).

	Dixcove	Abuesi	New Takoradi
Geography	Hilly areas Mainly rocky beaches	Flat and hilly landscapes Slightly curved sandy beaches Rocky outcrops in the near shore areas	Hilly grounds Steep slopes Valleys Sandy beach interspersed with near shore rocky bottom
Vegetation	Coconut trees Grass and shrubs	Coconut trees Grass and shrubs Lush tropical foliage	Forest reserve
Main livelihood	Small-scale Fishing	Small-scale Fishing	Small-scale Fishing
District Assembly	Ahanta West	Shama	Sekondi-Takoradi Metropolitan
Population size (approximate)	30,000	9,059	18,668

3 planning officers responsible for each of those communities, 2 officers from the Ghana Fisheries Commission, and 2 officers from Non-Governmental Organisations (NGOs), i.e., Friends of the Nation and Hen Mpoano. Each community has chief fisherman and traditional community chiefs. The chief fishermen take charge of fisheries issues at the landing beaches and in the communities. They also represent fishers in all matters. The community chiefs are custodians of culture, customary laws, traditions and history, and community land. They are also initiators of development (including fisheries related issues), and

Table 3

Key stressors in the communities studied (Freduah, 2017).

Stressor	Manifestation
Climate-related	
Increasing coastal erosion	Sea reaches the coastline and washes it away
More frequent and intense storms and waves	Storms are rough and strong; Waves are rough and reaches places that they could not reach in the past Waves make the sea highly dangerous for fishing
Non-climate	
Decreasing catches	Low daily/weekly catches Not enough fish for fish mongers to buy
Increasing cost and scarcity of pre-mix fuel	Fishers buying pre-mix fuel from unauthorised individuals/middlemen at higher cost Waiting for weeks to buy pre-mix fuel Travelling to other communities to buy fuel Spending more money on pre-mix fuel
Strict fisheries legislation and policies	Ruthless confiscation of monofilament nets by the government
Competition from oil and gas industry	Presence of rig supply boats in the traditional fishing grounds of small scale fishers Destruction of fishers' laid nets by supply boats
Sand mining along beaches	Sand blocks and heaps of sand at the beaches for sale
Increasing occurrence of algal bloom	Algal bloom at beaches, on the surface and bottom of the sea Odours on the beach

maintain community law and order by settling civil and non-criminal disputes.

Fisher respondents were selected through a combination of purposive and snowball sampling strategies (Robinson, 2014; Yin, 2011).

Table 4
Key documents collected and analysed.

Document	Relevance	Source
UNDP Climate Change Country Profile	Identification of climate stressors	Websites of the School of Geography and Environment, University of Oxford, UK (http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/) (accessed 2 January 2016)
Ghana National Climate Change Policy-2013	Identify specific aspects of the policy relevant to SSCF	Ministry of Environment, Science, Technology and Innovation, Ghana
Ghana National Climate Change Adaptation Strategy-2010 to 2020	Identify strategies likely to build that adaptive capacity of SSCF to stressors	Ministry of Environment, Science, Technology and Innovation, Ghana.
District development plans (2014–2017) covering Dixcove, Abuesi and New Takoradi	Understanding of planning and resource allocation processes for responding to specific stressors	Ahanta West District Assembly Shama District Assembly Sekondi-Takoradi Metropolitan Assembly
Fisheries Management Plans of Ghana, Marine Sector (2015–2019)	Understanding of specific stressors and response strategies	Ghana Fisheries Commission
Local government Act	Understanding of how the local governance structures affect capital mobilisation to the specific stressors	Ministry of Local Government and Rural Development
Report on Conditions of Coastal Communities and Coastline in the Western Region	Understanding of specific stressors and response strategies	Friends of the Nation (an NGO)
2010 Ghana Census Report	Socio-economic characterisation of communities studied, including demographics (e.g., occupation, population distributions, etc.), existing capitals	Ghana Population Council

Fisher respondents were household heads, and full-time fishers with over 5 years of fishing experience. The traditional leaders were chosen because of their role in the development of SSCF and coastal communities. Organisation respondents were chosen because of their involvement and experience with SSCF in the selected coastal communities.

Participant observation was conducted at the fishing landing sites, markets and households to capture information on self-mobilisation activities, information sharing among participants, social cohesion (e.g., social, cultural, and political capitals), characteristics of fisheries (e.g., type of gears, fishing methods, and features of the fishing grounds) and conditions of the coastal environment (i.e., natural capital). It aided gaining a better understanding of the environment in which the people live, perform their daily activities, face and solve their challenges and problems. Participant observation also offered a better understanding of practices, such as the use of light and chemical fishing, that participants were reluctant to reveal during the interviews.

Documents included official reports, management plans, development plan submissions, census report, legislation, and policy records (Table 4). The documents provided background information about the communities studied, such as types and characteristics of resources, socio-economic activities, prevailing stressors, institutions and governance system. They helped to contextualise the interview and observation data; and, also proved useful in corroborating such data (Yin, 2013).

Data analysis was based on standard methods of qualitative research. Interview transcripts and notes from the observations were coded based on the nature of the stressors (climate and non-climate), forms of capitals used and mobilised in responding to such stressors, and the processes of use and mobilisation of the different forms of capitals. The coding process generated categories and themes that were later consolidated.

The three communities studied are very similar in their governance structure, ethnicity and more importantly, types of multiple stressors confronting them. Consequently, the processes of mobilising adaptive capacity are also much alike across these communities. Therefore, the communities studied were addressed together rather than comparatively.

3. Results

Key climate and non-climate stressors affecting SSCF in the communities studied include: increasing coastal erosion, strong waves and

more storms, decreasing catches, increasing cost and scarcity of pre-mix fuel, harsh implementation of fisheries regulations, competition with oil and gas industry, sand mining along beaches, and increasing occurrence of algal bloom. Different actors (fishers, District Assembly, Fisheries Commission and non-governmental organisations) mobilise primarily cultural, social and political capitals (main-available capitals) in response to these stressors (Table 5). The processes of mobilising these capitals involved complex interactions with other forms of capital (i.e., supporting-available capitals). Here, cultural, social and political capitals are used to demonstrate such processes. It is important to note that only fishers mobilised cultural capital among the group of respondents. Another form of capitals, desired capitals, were also identified as important for preferred responses to stressors. Unlike the available capitals, these forms of capital (e.g., built capitals) were not readily available to fishers and the fishing communities but were perceived to be the desired capitals in response to most stressors.

3.1. Mobilising and using cultural capital

Cultural capital is one of the main-available capitals mobilised in response to multiple stressors, including increasing coastal erosion, more and frequent waves and storms, decreasing catches, and high costs and scarcity of pre-mix fuel. For example, cultural capital in the form of local innovation is mobilised and used in “building refuse and sand bag sea walls” in response to coastal erosion. In this process, communities modified their refuse disposal practices by heaping refuse into walls along the beaches to check erosion. Under normal conditions, i.e., without increasing coastal erosion, or if engineered sea wall were provided in response to coastal erosion, they would dump waste on designated sanitary sites as opposed to the beaches. This local innovation is then reinforced with supporting-available capitals such as local leadership (human capital), funds from fishers (financial capital), beach sand (natural capital) and collective action (social capital). Fig. 2 illustrates the processes of mobilisation and use of cultural capital in response to climate-related stressors.

In building such sea walls, local leadership, i.e., chief fishermen and the community chiefs, encourage the entire community to dump refuse and sand bags along the beaches to serve as sea defence. These leaders mobilise funds from fishers to buy wooden boards and nails. The refuse is obtained from various households in the fishing communities. The sand, i.e., natural capital, is extracted from the beach using collective action (social capital). The local leadership organises members of the community (mainly fishers) to construct a wall with the wooden boards

Table 5
Capitals used and mobilised by different actors for current and preferred responses to stressors.

Stressors	Current responses		Preferred responses	
	Capital	Description	Capital	Description
Increasing coastal erosion	Cultural	Fishers: Building sea defence with household refuse and sand bags	Political	Fishers: Complaints to the government for the construction of engineered seawalls
	Political	Complaints to the district assembly and traditional leaders for assistance		
	Social	District Assemblies (DA): Record and reporting related issues to the Ministry of Works, Housing and Water resources	Political	District Assemblies: Complaints to the Ministry for prompt response, i.e., building of engineered seawalls
Strong waves and more storms	Cultural	Fishers: Use of household refuse as a sea defence wall	Political	Fishers: Complaints to the government for the construction of engineered seawalls and modern landing beaches
	Cultural	Breaking from fishing when storms and waves are strong		
	Political	Helping each other to carry boats and other fishing gears to safer places when storms and waves are expected.		
Decreasing catches	Social	Complaints to the district assembly and traditional leaders for assistance.	Political	District Assemblies: Complaints to the Ministry for quick response i.e., building of engineered seawalls
		District Assemblies: Record and reporting related issues to the Ministry of Works, Housing and Water resources		
	Cultural	Fishers: Use of light and chemicals for fishing to increase catches.	Political	Fishers: Complaints to the government to completely stop the use of light and chemical fishing by small and bigger boats
		Longer fishing trips to make adequate catches		
		Reducing the number and frequency of fishing		Appealing to the government and other organisations to sensitise and help the youth to pursue other sources of livelihood
	Social	Praying to deities for more catches		
Increasing cost and scarcity of pre-mix fuel	Social	District Assemblies: Collaborating with NGOs and the Fisheries commission to create awareness and enforce fisheries regulations and laws.	Social	District Assemblies: Establishing more collaborations with potential development partners
	Human	NGOs: Conducting research and creating awareness among fishers.	Human	Exploring new strategies increase internally generated funds (IGF)
			Social	NGOs: Keeping good relationships with old donors while exploring new ones to secure regular sources of funds to intensify research and awareness creation.
	Political	Fisheries Commission (FC): Arresting perpetrators of unauthorised fishing and destroying related gears	Political	Fisheries Commission: Appeal to the government and other organisations to sensitise and help the youth to pursue other sources of livelihood
	Human	Awareness creation among fishers stop bad fishing practices		
Harsh implementation of fisheries regulations	Cultural	Fishers: Fishers mix ordinary petrol with engine oil and use it as substitute for pre-mix fuel.	Political	Fishers: Asking for governmental intervention to ensure that the pre-mix fuel regularly and exclusively supplied to fishers
		Use of light and chemicals by some fishers to increase catches to cover for their high operation cost resulting from the high coast and scarcity of pre-mix fuel.		
		Some fishers break from fishing		
	Political	Travel to other fishing communities and buy pre-mix fuel		
		Reducing the number of fishing days		
Competition with oil and gas industry	Social	Complaints to the Government and local authorities	Political	District Assemblies: Asking for governmental intervention to ensure that the pre-mix fuel regularly and exclusively supplied to fishers
		District Assemblies: Collaborate with the police to arrest and prosecute smugglers of pre-mix fuel		
	Human	Conduct periodic audit into the distribution of the Pre-mix fuel		
	Cultural	Fishers: High resistance to the surveillance team that captures monofilament nets and other destructive gears	Political	Fishers: Seeking help from the government to acquire the right fishing nets (Multifilament nets)
	Political	Complaints to the Government for assistance		
Sand mining along beaches	Social	Fishers: Dialogue with the oil companies on how to ensure safety at sea	Political	Fishers: Seeking governmental intervention to allow fishers to fish closer to the oil rig
	Human	Fishers: Efforts by local chiefs to ban sand mining		Fishers: Seeking governmental intervention government to stop the sand mining
	Cultural	Fishers: Stopping fishing when the algal bloom occurs		Fishers: Any possible assistance from the government
Increasing occurrence of algal bloom				District Assemblies, NGOs and the Fisheries Commission: Requesting assistance from the government and other stakeholders to conduct research into the source of the algal bloom

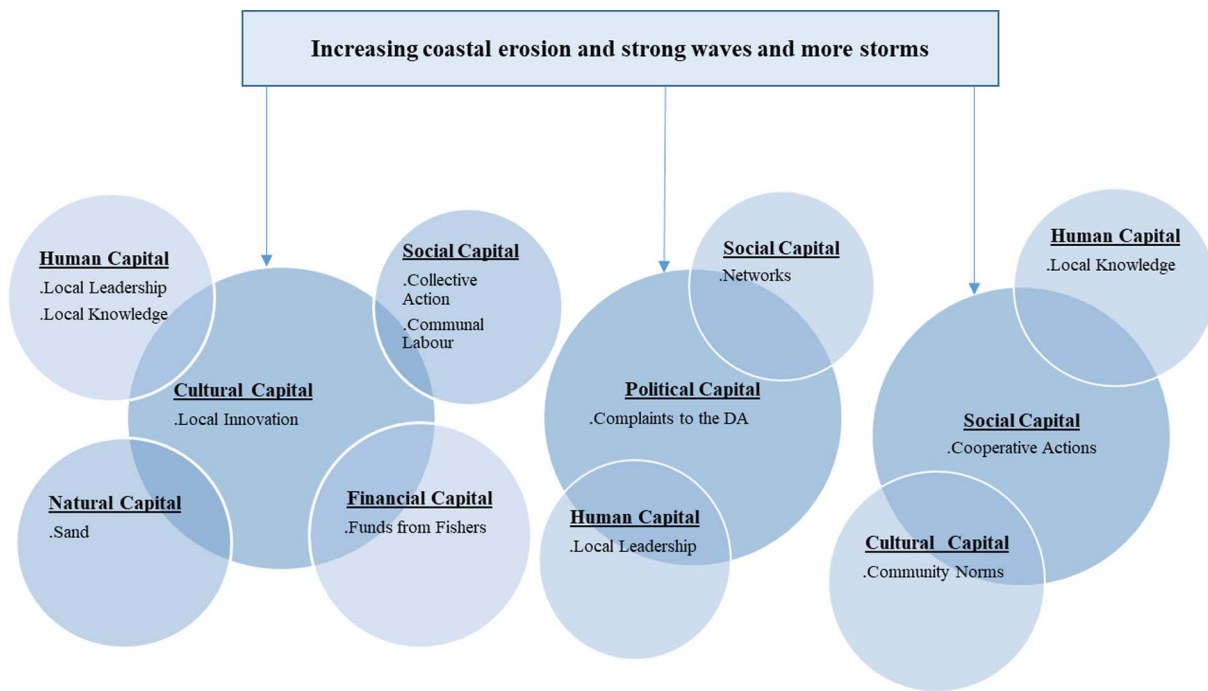


Fig. 2. Example of interactions among capitals in response to increasing coastal erosion, strong waves and more storms. Larger circles indicate “main-available” capitals; smaller circles indicate “supporting-available capitals”.

or worn out fishing nets using collective action (i.e., communal labour). Communal labour is also used to fill the sand bags. As a community norm (cultural capital), these bags and house hold refuse are heaped behind the wooden and nets walls to create a sea defence wall. Nevertheless, fishers stated preference for mobilising built capital in the form of engineered seawalls and modern landing beaches as they persistently seek governmental support.

Another example refers to modifying cultural capital by breaking from fishing when storms and waves are intensified. In this case, the fishers receive support in the form of money and food from family members and friends, i.e., bonding ties (social capital), when on long fishing breaks.

Moreover, fishers mobilise cultural capital, in the form of new technology, local innovation and beliefs in response to decreasing catches. They mobilise new technology, i.e., the use of light, chemicals, Global Positioning System (GPS) and ice to increase catches or make longer fishing trips. We found that these forms of cultural capital are supported by fishers’ learning capacity (human capital), corrupt practices, i.e., smuggling of pre-mixed fuel (cultural capital), funds from fishing (financial capital), links with outside organisations, i.e., networks (social capital) and training (human capacity). Pre-mixed fuel was found to be heavily subsidized by the government to support SSCF. However, the smuggling makes it scarce and expensive, defeating the purpose of the subsidy.

Fishers expressed they imitated the practice of light and chemical fishing from large inshore vessels. They used financial capital (earnings from fishing) to acquire generator assisted light-emitting diode (LED) bulbs, generators, smaller boats and dynamites/DDT needed for this type of fishing. The LED bulbs are lowered into the sea to attract the fish, which is then killed with dynamite or DDT. The fishers acknowledged the use of such methods are illegal as the government, through the coastal surveillance and monitoring team, tries to arrest them and confiscate their gears. Notwithstanding, the fishers explained they still fish with such methods because it is easy to bribe some of the law enforcing officers.

Similarly, fishers use financial capital to purchase GPS, ice bars and additional pre-mix fuel to make longer fishing trips (2 or 3 days at a

time), as opposed to the traditional 6-days with one return trips. The fishers have links with GPS companies in Accra (network), which are used by such companies to sell the GPS in the fishing communities. The companies also provide training on how to use the GPS (human capital). The fishers expressed that with the help of the GPS, they can trace their way back to their communities when they make long fishing trips. Fishers’ networks also include links with ice companies (social capital) in Takoradi and Komenda. The fishers use the ice bars to preserve catches when at the sea for 2 or more days. Similar to the light and chemical fishing, the fishers imitated this new technology from bigger inshore vessels. They expressed this new technology has greatly modified their fishing practice (cultural capital), as they can stay at sea for longer periods.

Some fishers rely on their beliefs (cultural capital), i.e., praying to deities for more catches as a response to decreasing catches. It is a common belief that such deities will help them when called upon. Such fishers often use social capital, in the form of associations, to ask their religious leaders to consult with the deities on their behalf.

Furthermore, cultural capital, in the form of improvising pre-mix fuel, new technologies (light and chemical fishing), corrupt practices (smuggling of pre-mix fuel) and local innovations (reducing the number of fishing days and breaking from fishing) is mobilised in response to increasing cost and scarcity of pre-mix fuel. Similar to the examples above, these forms of cultural capital are supported by fishers’ learning ability (human capital), links with outside communities, i.e., networks (social capital) and help from family members and friends, i.e., bonding ties (social capital). We found that light and chemical fishing and innovation to reduce the number and frequency of fishing days were mobilised and used with the same processes as in the case of decreasing catches; but, conversely, with the purpose of increasing catches to cover for the high operational costs attributed to expensive fuel. In addition, fishers improvise pre-mix fuel from ordinary petrol and engine oil which are readily available (cultural capital). Fishers have learnt, by trial and error, how to mix the fuels in right proportions for their outboard engines (human capital). Some fishers also depend on networks, i.e., their contacts in other fishing communities (social capital), to travel and buy smuggled pre-mix fuel.

3.2. Mobilising and using social capital

Social capital, in the form of collective action, collaboration and networks, is another main-available capital mobilised by both fishers and organisations in response to more frequent storms and waves, coastal erosion, decreasing catches, and high costs and scarcity of pre-mix fuel. We found that fishers mobilise and use collective action (social capital) to help each other move their boats and fishing gears to safer places as a response to strong storms and waves. Collective action is supported by community norms (cultural capital) and local knowledge of storms (human capital). As a community norm, the fishers are always willing to help each other keep their boats and gears away from the effects of storms and waves. Further, the fishers can, to some extent, predict strong waves and storms using local knowledge.

The District Assemblies (DAs) mobilise social capital by using their networks to report the occurrences of coastal erosion, strong waves and storms to the Ministry of Works, Housing and Water Resources for appropriate action. The DAs expressed dissatisfaction with this process since the ministry has often failed to respond. They would prefer to mobilise social capital by seeking collaborations with other organisations and NGOs to assist the government in building engineered sea defence wall (built capital).

The DAs also mobilise social capital in response to decreasing catches by collaborating with NGOs, i.e., Friends of the Nation (FoN) and Hen Mpoano, and the Fisheries Commission (FC). Such collaboration aims to create awareness on the effects of destructive fishing methods (increase human capital), and enforce the laws prohibiting such practices (increasing political capital). The DAs use its community mobilisation skills (human capital) to enable the participation of fishers and community members in awareness creation programs facilitated by NGOs and FC. The DAs also provide the FC with vital information about fishers and their activities (human capital). Such information is used for tracking and stopping fishers from using destructive fishing practices. In this regard, the DAs reportedly collaborate with the district police by providing important information leading to the arrest and prosecution of hoarders and smugglers of pre-mix fuel.

Another example of mobilisation and use of social capital in response to decreasing catches is the collaboration between the FC and the Ghana Navy and respective DAs to patrol the sea and coastal communities, resulting in possible arrest of illegal fishers, and confiscation and destruction of banned gear (light, chemicals and monofilament nets). In this case, the Navy provides the FC with personnel, speed boats, security and navigation equipment; and, the DAs, as mentioned above, provide information about fishers and their activities.

We found that FoN has collaborated with DA planners to develop an integrated coastal management tool kit for local communities (human capital). This kit is expected to inform and guide coastal communities to plan in response to stressors, such as coastal erosion, decreasing catches, competition with oils and gas industry and sand mining. Hen Mpoano also collaborated with Coastal Resources Center (CRC) to establish an integrated coastal fisheries governance initiative for Western Region funded by the United States Agency for International Development (USAID). Consequently, the Shama district (including Abuesi) was assisted to adopt Ghana's first shoreline management plan. Notwithstanding, the NGOs complain about infrequent engagement with fishing communities because of intermittent access to funds (financial capital). They would prefer access to more regular and sustained funds (increased financial capital) to intensify research and capacity building (increased human capital). The NGOs expect to achieve funding security by keeping good relationships with existing donors while exploring new links with other organisations (increased social capital). The NGOs also complained about losing assembly staff trained in coastal issues when they are transferred to non-coastal districts as part of the assemblies' staff transfer systems (decreased human capital). Fig. 3 illustrates the processes of mobilisation and use of social capital

in response to decreasing catches.

3.3. Mobilising and using political capital

Political capital, in the form of persistent complaints and appeals to the government and relevant organisations, is a main-available capital mobilised in response to all the stressors (Fig. 4 illustrates the mobilisation and use of political capital in response to high cost and scarcity of pre-mix fuel); it also features in all strategies fishers indicated as the preferred capital in responding to stressors. To make their voices heard, the fishers lodge their complaints through the local leadership, i.e., Assemblymen, chief fishermen and the community chiefs (human capital) and local Frequency Modulation (FM) radio stations i.e., using their networks. The fishers expressed that they frequently complain to the chief fishermen who have the responsibility to inform the chiefs of the towns or the Assemblymen about stressors, such as coastal erosion, high cost and scarcity of pre-mix fuel. The assemblymen are then responsible for presenting the complaints to the DA for the necessary response. The fishers expressed that they use the local FM stations as important channels to appeal to NGOs and other organisations for help. It is also used to warn Members of Parliament and the government about the risk of losing fishers' votes in future elections if their demands are not met.

Equally important, for all the strategies indicated by fishers as preferred in responses to stressors, political capital would be mobilised and used, as described above, by expressing their voices to:

- demand the government modify and intensify efforts to stop light, chemical fishing and other unauthorised fishing practices to address decreasing catches,
- urge the government to stop smuggling and hoarding of the pre-mix fuel and ensure exclusive and regular supply to fishers,
- persuade the government to construct engineered sea defence walls and landing beaches (built capital) to control increasing coastal erosion, strong waves and more frequent storms, and
- attract financial and collaborative support from the government and other stakeholders to sensitise the youth to change the local perception that fishing is the only important livelihood activity available, and support them to learn and undertake alternative livelihoods.

4. Discussion

This study examines how adaptive capacity, defined in terms of a set of capitals, is mobilised and used in response to multiple stressors. It offers a deep insight into the synergies among important forms of capital for enhancing adaptive capacity with significant implications for adaptation and vulnerability research, policy and practice. It shows that mobilising such capacity involves two classes of available capital, i.e., main-available capitals (cultural, social and political capitals), which are reinforced by the supporting-available capitals. Further, the mobilisation and use of adaptive capacity consist of complex and interactive processes involving these two classes of capitals. Desired capitals were also identified by respondents to be important for responding to stressors. Unlike the available capitals, these forms of capital were not readily available to fishers and the fishing communities, but were perceived to be the desired capitals in response to most stressors. These insights are discussed below.

4.1. The inherent nature of adaptive capacity (capitals)

Adaptive capacity of SSCF in the Western Region of Ghana and elsewhere is defined by main-available capitals. These capitals have the potential to reduce immediate effects of stressors but could lead to negative outcomes depending on how they are mobilised and used in response to stressors (e.g., coastal erosion and decreasing catches). In

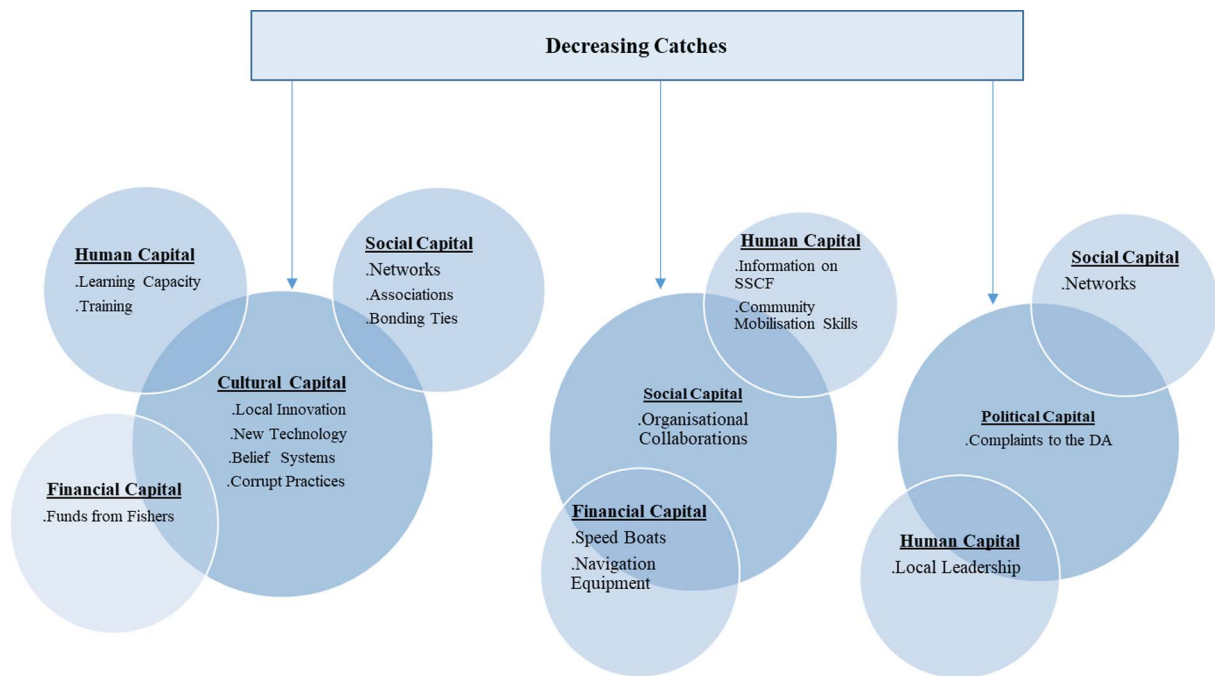


Fig. 3. Example of interactions among capitals in response to decreasing catches. Larger circles indicate “main-available” capitals; smaller circles indicate “supporting-available” capitals.

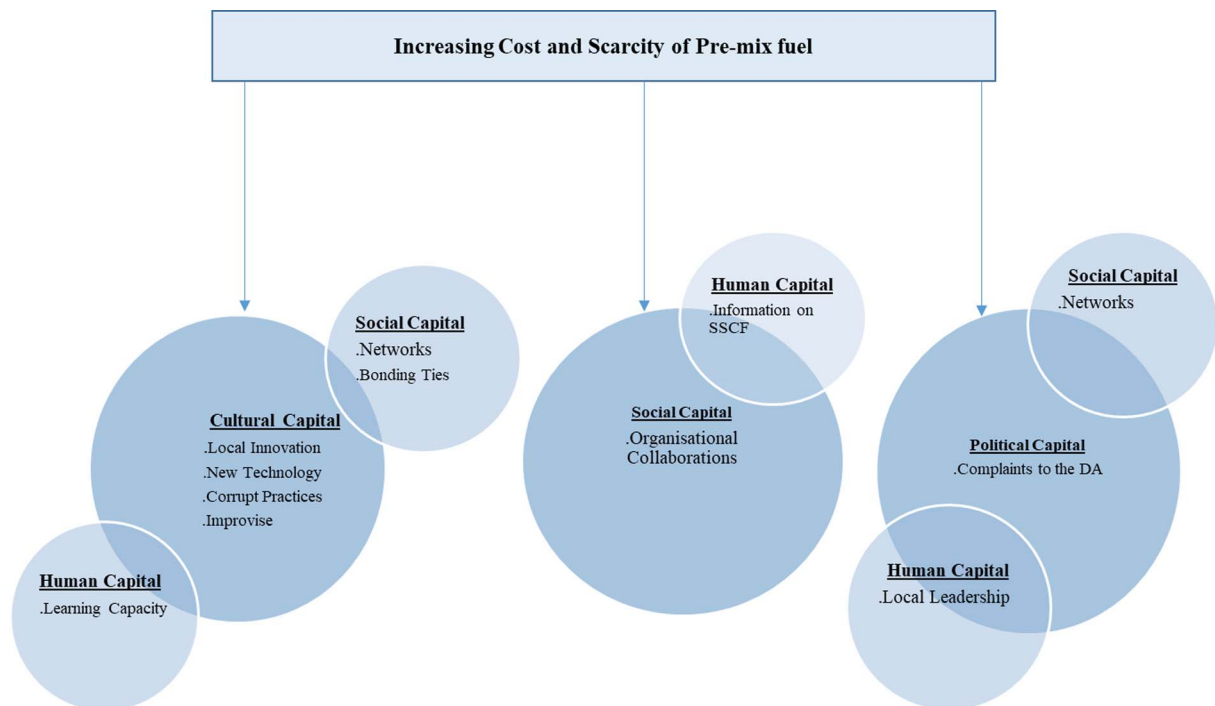


Fig. 4. Examples of interactions among capitals in response to increasing cost and scarcity of pre-mix fuel. Larger circles indicate “main-available” capitals; smaller circles indicate “supporting-available” capitals.

the communities studied, the mobilisation and use of these capitals are a matter of necessity rather than a choice given the limited response from the government and support from relevant organisations. In essence, these capitals (in different forms) are entrenched qualities of the community or fishers (i.e., inherent capacity) used in response to multiple stressors. They invariably determine the type of responses and/or adaptation that can be undertaken. Consistent with how Nelson et al. (2007) and Brooks (2003) conceptualise adaptive capacity, these main-available capitals can also be termed as the communities’ pre-condition or potential to adapt.

In the face of non-responsive government and limited organisational support, fishers and communities mobilise and use local innovations, new fishing practices and technologies (cultural capital) in response to key stressors, such as coastal erosion, decreasing catches and high cost and scarcity of pre-mix fuel. These forms of capital range from the construction of refuse sea defence walls to the use of light and chemical fishing, showing that fishers mobilise capitals that are readily available – as opposed to what would be the most suitable capitals to respond to stressors, leading to long term adaptation. The socio-cultural conditions (social and cultural capitals) are vitally important in determining

communities' adaptive capacity to climate and non-climate stressors because they can limit or enhance the success of adaptation (Jones and Boyd, 2011). Wagner et al. (2014) argue that communities may be motivated to invest in new technologies to adapt to stressors if they are informed about the importance of adaptation and the shared responsibility for adaptation. However, our findings suggest that in case there is a pressing need to respond to stressors, communities may also resort to the use of new technologies – even though such technologies may not necessarily be appropriate. This is illustrated by the use of improvised pre-mix fuel in the communities studied, which is expensive and has the potential to shorten outboard engine life. Future research on understanding the factors that determine how local innovations and new technologies are used in different sectors and geographical settings would be beneficial in improving the understanding of how adaptive capacity is mobilised.

Similarly, social capital is an indispensable capital mobilised, particularly in a context where the government is unable (or unwilling) to provide desired capitals (e.g., built capital in the form of engineered sea wall and modern landing facilities) in response to pressing stressors. Our findings show how social capital in the form of collective action is mobilised by fishers in response to storms and waves. As noted by Pelling and High (2005), the use of communal or collective action in response to climate change is more likely in communities with inherent social capital. Communities also mobilised social capital in the form of external links and collaborations. In this study, responses to decreasing catches and high cost and scarcity of pre-mix fuel illustrate the use of social capital in the form of collaborations and networks.

Further, the ability to establish external links can offer fishers the opportunity to access capitals that can be used in response to both current and future stressors. Similarly, Adger (2010) uses two cases of coastal communities in Trinidad and Tobago and Vietnam to argue that networks play a critical role in coping with climate-related hazards in dysfunctional systems. Pahl-Wostl (2009) argues for the need to promote a good balance between formal and informal institutions to provide the enabling environment for non-state actors to respond creatively and innovatively to stressors.

The insights discussed here underscore the need to help communities and fishers to increase social capital, especially networking with external organisations, to access assistance (e.g., new skills and funds for alternative livelihood and modern landing facilities) in responding to stressors. This is particularly important given the communities studied have no hope for the government to meet their expectations. Future research on how to promote positive learning between fishers and other stakeholders, such as NGOs and donors would be beneficial. Moreover, multiple stressors and needs of fishers should be considered in research, plans and policies aiming to support SSCF and coastal communities.

Last, political capital is prominent feature in the responses to all the stressors investigated. By making their voices heard, fishers aim to draw attention of government and NGOs to their needs. Eakin et al. (2014) highlight the need for governments to organise and distribute the necessary resources to support adaptation. In this case, the government has a critical role in the mobilisation and use of capitals in response to stressors. This includes empowering fishers to participate in adaptation decisions and implementation. Future research on how vulnerable communities could influence government to provide the required capitals in response to stressors would be beneficial.

The use of the main-available capitals discussed above is very revealing, particularly in situations where the government or relevant organisations are unable or unwilling to assist vulnerable sectors and communities (e.g., fishers). This suggests that main-available capitals may be essential to these sectors and communities similar to those studied here. However, the relative importance of these available capitals are context specific because adaptive capacity varies over time, space, among communities and sectors (Smit and Wandel, 2006). We propose that helping develop these main-available capitals, through

policies and development plans, is a promising strategy to enhance overall adaptive capacity.

Supporting-available capitals are crucial as they play a critical role in assisting the use and mobilisation of these main-available capitals. Further, the process of mobilising and using adaptive capacity involves complex interactions among these two categories of capital. These interactive processes are the foundation for mobilising adaptive capacity as discussed next.

4.2. Interactive nature of adaptive capacity (main-available and supporting-available capitals) mobilisation

In mobilising cultural capital (i.e., local innovation) in response to increasing coastal erosion, more frequent storms and waves, local leadership played an important supporting role. It proved critical in mobilising fishers and community members to build the refuse defence walls, and accept it as a community practice (cultural capital). Further, leadership help mobilises profits from fishing (financial capital) towards the construction of such walls. In fact, without strong leadership (human capital) communities may not succeed in responding to climate change (Gupta et al., 2010). People's ability to respond or adapt to stressors is partly found in the quality and quantity of its leadership skills (Dolan and Walker, 2006). Notwithstanding, issues of local leadership are often ignored in the processes of adaptive capacity, adaptation planning and policy formulation (Measham et al., 2011).

Similarly, fishers' learning ability (human capital) and networks with outside businesses (social capital) were important supporting capitals that helped mobilise and use new technologies and practices (e.g., use of GPS, ice and improvised pre-mix fuel) (cultural capital) (Fig. 4). Fishers have imitated practices used by larger fishing vessels (e.g., use GPS and ice) (human capital), and improvised the fuel by trial and error methods. Learning ability is critical for enhancing or limiting adaptive capacity (Bettini et al., 2015; Pelling et al., 2008). Fishers acquired the GPS (and the skills to use them) and ice through links with companies based in Accra (social capital). This highlights the important role of social capital in introducing new technologies and encouraging learning. Social capital can, therefore, facilitate the mutual transfer of innovation and technologies between communities and external organisations; ultimately, supporting adaptive capacity (Pelling and High, 2005).

Fishers make their voices heard in responding to stressors (i.e., political capital) through traditional leadership (the chief fisherman and traditional chief of fishing communities), and local FM radio stations (i.e., networks-social capital) (Figs. 2–4). This further shows the critical supporting role of local leadership (human capital) and networks (social capital) in demanding the right to sustainable adaptations on behalf of fishers. Besides, being expected to be visionary, directional and instrumental in guiding people to respond to stressors (Gupta et al., 2010), leadership can play an important role by providing voice to those at the margins of decision-making, as demonstrated in our study.

In mobilising social capital, in the form of collective action (e.g., moving boats and fishing gear to safety), the communities' norm of helping each other in times of need (cultural capital) and fishers' local knowledge of storms (human capital) were critical in responding to stressors. Cultural capital determines the rules and responsibilities for how community members interact collectively (Flora et al., 2004; Bebbington, 1999; Bourdieu, 1986). Also, fishers' local knowledge to predict the occurrences strong storms and waves help them to plan and seek help in moving boats to safety. However, complementing local knowledge with scientific knowledge about climate change would enhance adaptive capacity (Armitage, 2005).

This study contributes to knowledge of adaptive capacity by providing additional explanation of how complex interactions among main-available and supporting-available capitals can strategically enhance general adaptive capacity to climate and non-climate stressors. In fact, this understanding allows us to underscore important synergies

among capitals that can enhance adaptive capacity even in poor marginalised sectors and communities.

Moreover, insights from this study can guide policy and decision-makers to plan strategically and proactively invest in main-available capitals, ultimately, enhancing adaptive capacity. This could be achieved by investing in few critical capitals. For instance, the local leadership could be trained in effective communication, lobbying and advocacy skills to make their voices heard beyond local settings to increase political capital. Moreover, building networking and collaboration skills would facilitate access to external partners, expertise, and funds. Further, investing in building local leaders' and fishers' awareness of global environmental change, importance of sustainable fisheries and fisheries regulations would be a strategic way of developing cultural capital. This is important because the innovation, technology, practice or initiative adopted in response to stressors depend largely on the level of awareness of the above-mentioned issues.

Knowledge of the interactive nature of adaptive capacity and how it is mobilised and invested is imperative for enhancing our understanding of adaptation. This can guide individuals or societies to make and implement decisions about the use of adaptive capacity in managing or taking advantage of real or anticipated stressors. In this case, decisions and plans likely to increase the effects of stressors and/or decrease the capacity to respond may be avoided.

4.3. Relevant policies, management and development plans likely to influence adaptive capacity

The Ghana National Climate Change Policy (NCCP), The National Climate Change Adaptation Strategy (NCCAS), Fisheries Management Plan and Medium-Term Development Plans (MTDPs) are likely to influence how adaptive capacity is mobilised in the communities studied. The NCCP 2013 provides that climate change and disaster risk reduction be mainstreamed into national development frameworks, and plans at national, regional and local levels (GoG, 2013). It also suggests the creation of an inter-ministerial oversight committee to link and coordinate activities among implementing ministries and organisations (social capital).

The NCCAS, 2010–2020 aims to develop alternative sources of livelihoods for fishers, create awareness on climate change and its adaptation strategies, build technical and financial capacities on alternative livelihoods strategies and strengthen the relationship between scientific knowledge and traditional knowledge, i.e., human capital (GoG, 2012). In planning to achieve these aims, the NCCAS allocates responsibilities for governmental and non-governmental organisations at national and subnational levels (social capital). National level government ministries and organisations are tasked with planning, monitoring and evaluation of the policy. Actual implementation of the policy is the responsibility of local level organisations such as the DAs, led by the Ministry of Environment, Science and Technology. The National Climate Change Committee (NCCC) will assist the ministry and DAs by providing guidance on the selection, preparation and sharing of responsibilities among local actors (human capital). Monitoring and evaluation of plans will be conducted by the monitoring and evaluation unit of the NCCC (human capital).

In addition, The FC's Fisheries Management Plan 2015–2019 proposes to address decreasing catches and non-compliance of fisheries legislation by reducing the current levels of fishing effort (FC, 2015). The FC acknowledges that implementing these plans will require adequate funding (financial capital), skills and personnel (human capital), and is committed to achieving them through the following actions: reviewing and prioritising allocation of financial capital from the fisheries development fund to support research (human capital) and enforcement (political capital), and seek multilateral cooperation and technical assistance (social capital) to sensitise and support fishers to start alternative livelihoods.

Responses proposed by the assembly's Medium Term Development

Plans (MTDPs) to declining catches, sand mining along beaches and coastal erosion include (AWDA, 2014; SDA, 2014; STMA, 2014): (1) reducing fishing-efforts and promote diversified livelihood (human capital) through inter-sectoral collaboration in fisheries management (social capital), (2) establishing fisheries co-management systems (social capital), (3) enacting by-laws (human capital) to control sand mining, (4) developing existing fish landing sites, (5) constructing sea defence walls for affected communities (built capital), and (6) increasing climate change awareness through research and education (human capital). The MTDPs identified both internal and external sources of capitals to execute their strategies. The internal sources include funds (financial capital) from District Assembly Common Fund (DACF), District Development Fund (DDF) and Internally Generated Funds (IGF). The external sources include collaborations with organisations and NGOs such as FC, USAID, FoN, and Henmpoano (social capital) to encourage and support livelihood diversification projects.

5. Conclusion

This study contributes to the corpus of research on adaptive capacity and adaptation by analysing the processes of mobilising adaptive capacity to climate and non-climate stressors in small-scale coastal fisheries of Ghana's Western Region. Our analysis shows that mobilising adaptive capacity involves a complex interaction among two categories of available capital, i.e., main and supporting capitals. The main-available capitals are community essential qualities mobilised and used in response to stressors as a matter of need rather than choice. These include cultural (local innovations, ability to improvise, new technologies, corrupt practices and belief systems), social (collective action, networks and social ties) and political (complaints to the government) capitals. The supporting-available capitals play an important role in reinforcing the mobilisation of the main-available capitals (e.g., local leadership, local knowledge, learning capacity [human capital] and networks, collective actions, associations and bonding ties [social capital]). Understanding the complex interaction among these types of capitals provides important insights for strategic development of adaptive capacity, and ultimately for implementing adaptation. We propose that a strategic way to enhance adaptive capacity is to develop the available capitals by focusing investment in few capitals, such as local leadership (human capital), networking and collaborations (social capital). We argue that these interactions, usually ignored in the global environmental literature, especially adaptive capacity and adaptation, should deserve more attention in future research aiming to contribute to a better understanding of how adaptive capacity is built and mobilised.

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